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Research Article

Neonatal pneumococcal meningitis

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Summary

Neonatal pneumococcal meningitis is rare, but serious due to its high mortality and severe psychomotor and neurosensory sequelae.

We report six cases of pneumococcal meningitis collected at the neonatal and neonatal resuscitation department of the CHU Mohamed VI, from January 2014 to July 2020. The aim of our work is to study the peculiarities, clinical, bacteriological, evolutionary of this pathology, and to analyze its transmission during the neonatal period. four patients are aged respectively, one day for one patient, 2 two days for 2 patients and three days for the 4th patient, so the most probable transmission route is transplacental. The other 2 patients were between 6 days and 15 days old, which suggests the probability of exogenous transmission. The clinical picture is variable and atypical, the fever associated with refusal of suckling is found in 100% of patients thus representing the most constant sign. Direct examination of the Cerebrospinal Fluid (CSF) identified the germ in all six cases.

The evolution was favorable and the complications are encountered in three patients.

Introduction

Pneumococcus is a major cause of invasive and non-invasive community infections. Invasive pneumococcal infections, especially meningitis, remain serious, with a mortality rate of over 8% and a high risk of sequelae [1]. Data on invasive pneumococcal disease in newborns are limited, studies have rarely focused on meningitis and published series have generally focused on infants up to 90 days of age [2]. The largest cohort of patients with S. pneumoniae meningitis under 28 days included 19 cases [3]. The diagnosis of pneumococcal meningitis is much more difficult. The severity of such infections leads to recall, In addition to the diagnostic criteria.

Patients and methods

This is a retrospective study with a descriptive and analytical aim covering the period from January 2014 to July 2020 carried out at the level of the neonatology and neonatal resuscitation service of the Mohamed VI CHU of the mother and children hospital of MOHAMMED VI Marrakech. The usable medical files of all newborns aged less than 28 days hospitalized for pneumococcal meningitis were retained. For each patient, we collected the age, sex, infectious history, mode of delivery, duration of symptoms, laboratory parameters, analysis of cerebrospinal fluid, medical care as well as evolution.

Consent and ethics: Informed consent from parents was obtained prior to patient recruitment.

Results

The six newborns were the result of unsuccessful term pregnancies, so we do not know the bacteriological status, blood cultures and peripheral samples of mothers. The delivery was vaginally for five newborns and by cezariene for the third case for suspected acute fetal distress. The admission age was one day, two days for 2 patients, and three days for the fourth patient, respectively. Therefore the most likely route of transmission is transplacental. The other 2 patients are aged 6 to 15 days, which suggests the probability of exogenous transmission. The clinical picture is variable and atypical,

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thermal disturbances associated with refusal of suckling are found in 100% of patients, Axial hypotonia was found in five newborns. The clinical features of the six newborns are illustrated in Table 1. The biological characteristics of the six newborns are shown in the Table 2. Transcontanellar ultrasound and brain scan revealed hydrocephalus in one newborn and signs of ventriculitis in four patients.

All newborns were put on third-generation cephalosporin at a dose of 100 mg / kg per day for ten days. associated with vancomycin 15 mg / kg / day for 14 days + ciprofloxacin 20 mg / kg / day for 21 days, in 4 patients with the presence of signs of ventriculitis.

Gardenal loading dose 20 mg / kg then maintenance dose 5 mg / kg in cases of convulsions.

Table 1: The clinical characteristics of the six newborns.

Observations			N1	N2	N3	N4	N5	N6
Sex			Male	Male	Female	Male	Male	Female
Admission age(Days) Gestational ages (week of amenorrhea)			J6 36 .5	J2 39.4	D3 40	D1 39	D2 40 .6	D15 41
Weight in grams			3600	3200	3300	3350	3100	3110
Rupture of the water bag	in	hours	<12	<12	>24	<12	<12	<12
Amnioticliquid			Clear	clear	Tinted	Clear	Clear	Clear
Temperature (°C)			39	37.5	38	37	34	39
Cranialperimeter in cm			36.5	35	34.5	35	35	35 .5
Fixity of gaze			Yes	No	No	No	No	No
Axial hypotonia			Yes	Yes	No	Yes	Yes	Yes
Tonic-clonic convulsion			Yes	No	No	No	No	Yes
Refused breastfeeding neuro-vegetative manifestations (respiratory distress, vasomotor disorders, attacks of tachycardia or bradycardias).		No	Yes n no	Yes no	Yes Yes	Yes Yes	Yes No	No Yes

The short-term outcome was favorable for three newborns and one newborn presented with hydrocephalus and four patients presented with ventriculitis, and in the long term one case of epilepsy and two cases of psychomotor retardation.

Discussion

***Streptococcus Pneumoniae* (SP):** Discovered by Pasteur in 1881, is a Gram-positive cocci, grouping in diplococcus, in candle flame or in short chains, colonizing the nasopharynx of humans and animals [4]. Auburtin M, et al. state that neonatal pneumococcal meningitis remains serious in newborns, with a mortality rate greater than 8% and a high risk of sequelae (30%) and their clinical expression may be atypical [5].

Pneumococcal meningitis is rare during the neonatal period (2.2%) [6]. Data on invasive pneumococcal disease in newborns are limited, studies have rarely focused on meningitis, and published series have generally focused on infants up to 90 days of age [7]. A study done at the Marrakech CHU in 2016 and published in 2018, pneumococcal meningitis represents 15% of neonatal meningitis [8].

During our series, two newborns were older than four days (between 6-15 days), which suggests an acquisition of pneumococcus from the nasopharyngeal flora of older siblings and family members, this is consistent with the literature [6] and four patients Sixty-six percent of pneumococcal meningitis fall within the framework of early neonatal infections (age <4 days), this is in favor of direct transmission either when crossing the mother's birth canal or by transplacental approach.

The clinical diagnosis of neonatal pneumococcal meningitis is much more difficult. It is evoked in front of a fever which can be moderate or even missed, then replaced by normo-or hypothermia. Seizures with no apparent cause occur in 40 to 50% of cases. It can all be summed up in behavioral disorders, or neurovegetative manifestations (respiratory distress, vasomotor disorders, attacks of tachycardia or bradycardias). Hypotonia, jaundice and refusal of the bottle in a climate of deterioration of thermoregulation should give the alarm. The

Table 2: The biological characteristics of the four newborns.

Observations	N1	N2	N3	N4	N5	N6
White blood cells (GB / mm3)	31000	6030	19510	16600	19200	30,000
CRP (mg / L)	61	83.35	50	135	51.5	60
lumbar puncture						
macroscopic aspect of CSF	bloody	cloudy	cloudy	cloudy	bloody	cloudy
White blood cells / mm3	900	4840	143	900	800	150
polynuclear neutrophil (%)	83	90	80	70	50	70
Glycorachia (g / L)	0.3	1.8	0.47	0.23	0.31	0.4
Proteinorachia (g / L)	0.75	1	1.46	2.59	1.14	2
Soluble antigens	pneumococcus	Pneumococcus	Not done	Pneumococcus	Not done	Not done
Direct microbiological examination of cerebrospinal fluid	*GPC*	*GPC in Diplococcus*	*GPC*	*GPC*	*GPC*	*GPC*
Culture	*S pneumoniae*	*S pneumoniae*	*Spneumoniae*	*S pneumoniae*	*S pneumoniae*	*S* Pneumococcus

GPC: Gram Positive Cocci; SPneumoniae: Streptococcus Pneumoniae; CRP: C Reactive Protein; CSF: Cerebrospinal Fluid

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bulging of the fontanel, so evocative when it exists, is only present in a third of cases. Hypotonia of the neck or abnormal stiffness when mobilizing the spine with head thrown back [7,9].

The blood count may include several abnormalities (hyperleukocytosis, leukopenia, thrombocytopenia), there remains an examination orienting towardsthe infectious origin and has no specificity in pneumococcal meningitis.

C reactive protein is a very important indicator of neonatal infection, it also makes it possible to point towards the bacterial origin of the infection [10]. In our series, no newborns had a C reactive protein level below 40mg/L

Confirmation of the diagnosis is based exclusively on the urgent examination of the Cerebrospinal Fluid (CSF). The diagnosis can be suspected upon gross examination of the fluid, if it is hypertensive or if it has lost its usual clarity. The level of White Blood Cells (WBC) in the CSF is often increased, as for the leukocyte formula, it typically shows a predominance of polynuclear neutrophil [11]. A variegated (lymphocytic) reaction can however precede the appearance of polymorphonuclear cells. Such a reaction can also be linked to the precocity of the examination or to an inadequate or insufficient prior antibiotic therapy (decapitated meningitis). The biochemical examination of the CSF namely glycorachia which is a very important element both for the diagnosis positive for meningitis only for orientation to its bacterial origin. The blood glucose-collapsed ratio is very suggestive. In newborns, a ratio less than or equal to 0.6 is considered abnormal [12]. A CSF glucose concentration of less than 20 mg/L is associated with a higher rate of auditory sequelae [13], in the case of bacterial meningitis, an abnormal proteinorachia (> 0.45 g/L). Direct examination (Gram stain on centrifugation pellet) often allows the probabilistic diagnosis of the responsible germ even before the results of the culture (Gram-positive cocci for *PNEUMOCOCCUS*, Gram-negative diplococcus for *MENINGOCOCCUS* and if a Gram-negative bacillus polymorphic for *HAEMOPHILUSINFLUENZAE* B) [14].

Transcontanellar ultrasound makes it possible to visualize during the course of neonatal pneumococcal meningitis, ventriculitis in the form of hyperechoic flake images in the ventricular lumen. An increase in ventricular volume indicates an incipient hydrocephalus linked to the reactionInflammatory, in our series the six patients underwent a transfontanellar echo, 4 of which had signs of ventriculitis [5].

Koster-Rasmussen et al. affirm that in newborns: Even before the identification of the germ by direct examination or culture, the fear of the pneumococcal probabilistic etiology of purulent meningitis leads to the start of a bi-antibiotic therapy (third-generation cephalosporin and aminoglycoside.) and the duration of treatment is 10 to 15 days [15]. In our study, this same therapeutic protocol was used with a duration varying between 15 to 21 days.

Pneumococcal meningitis is life-threatening and functional (10% mortality and 30% sequelae). The elements of poor prognosis are above all the delay in starting a bactericidal treatment, but also the pneumococcal germ, the severity of the initial neurological picture, the existence of an associated collapse or signs of intracranial hypertension, treated late [5].

In our series, the evolution was favorable, and three patients presented sequelae (one case of epilepsy and two cases of psychomotor retardation).

Conclusion

It emerges from this study the non-specificity of the signs of purulent meningitis in the neonatal period.Lumbar puncture remains the fundamental examination for the diagnosis. Both routes of transmission are possible (direct and indirect transmission). Given the immediate severity of the disease and its many sequelae, sometimes disabling, early treatment with generalized pneumococcal vaccination is justified.

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