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Review Article

The characteristics and therapeutic management of nosocomial neonatal meningitis in Serratia Marcescens in a Moroccan neonatal unit

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Abstract:

Introduction : Meningitis in Serratia marcescens (S. marcescens) are rare but potentially serious, especially in newborns. They require rapid identification, adequate management combined with rigorous aseptic rules.

Objective: Report the experience of our department in the management of neonatal meningitis due to S. marcescens.

Material and methods: Retrospective study of 4 cases of neonatal nosocomial meningitis due to S. marcescens hospitalized in the neonatal intensive care unit at Marrakech University Hospital during an epidemic between January and March 2023.

Results : Of 32 patients who developed a nosocomial S infection. marcescens12.5% presented meningitis with the same organism. The average term was 35.2 weeks of amenorrhea. The average age of admission was 2.6 days. The average time between hospitalization and development of meningitis was 4.5 days. Clinically: 3 patients presented a fever, 2 developed hypotonia with refusal to breastfeed and one presented generalized convulsions, a bulging fontanelle with an increase in head circumference. Pleocytosis, hyperproteinorachia and hypoglycorachia were constant in all our patients. We noted resistance to all antibiotics in all cases. All of our patients had at least onepositive blood culture S. marcescens. Transfontanellar ultrasound revealed ventriculitis in a newborn. All of our patients benefited from geographic isolation and were treated with Meropenem and Amikacin. The evolution was favorable in 3 newborns and we noted the death of only one case (low weight).

Conclusion: Early identification of patients with this type of meningitis and rapid implementation of control measures are essential to curb the spread of this severe infection.

Key words: Serratia marcescens, meningitis, epidemics and newborns

Introduction

THENosocomial infections represent a serious health problem in neonatal intensive care units due to the morbidity and mortality they cause as well as the difficulty of their management. S. marcescens is an omnipresent opportunistic pathogen from the Enterobacteriaceae family which belongs to the Gram-negative bacilli (GNB) and whose eradication from the environment is very difficult [1]. Nosocomial S. Marcescens infections are rare in newborns and often described as epidemics [1,2]. The infection can occur in the form of pneumonia, bacteremia, conjunctivitis, urinary tract infections and even gastroenteritis and exceptionally meningitis, hence the interest of our work which illustrates a series of 4 cases. Meningitis caused by this germ is serious because of its high morbidity and mortality, the neurosensory aftereffects that can be caused and the immune fragility of the newborn, hence the importance of initiating, as soon as this germ is diagnosed, appropriate measures. control before its spread which can be spectacular.

Material and methods:

This is a retrospective descriptive study of 4 cases of neonatal nosocomial S marcescens meningitis, carried out at the neonatal intensive care unit (NICU) of the Mohammed VI University Hospital, Marrakech, Morocco. During the fourth epidemic of this germ, between January and March

2023. Our study population included newborns hospitalized in the NICU, whose postnatal age ranged from 0 to 28 days. The diagnosis of nosocomial meningitis due to S. marcescens was made based on the lumbar puncture culture. Data collection is done from an individual file. The literature review was carried out on Pub-Med using the following key words: Serratia marcescens, meningitis, NICU, epidemics and newborns.

Results :

Of 32 patients who developed a nosocomial S infectionmarcescens, 4 patients or 12.5% presented meningitis with the same germ, including 3 boys and one girl. The average term of our patients was 35.2 weeks of amenorrhea. The average age of admission was 2.6 days with extremes ranging from1 to 4 days. The average time between hospitalization and the development of S. meningitis. Marcescens was 4.5 days[3 and 6]**.**Concerning the clinical signs: 3 patients presented a fever, 2 developed hypotonia with refusal to breastfeed and one presented generalized convulsions, a bulging fontanelle with an increase in head circumference. On a biological level, Pleocytosis and hypoglycorachia were constant in all our patients and the average proteinorachia in our series was 2.7g/l.[1,6 and 8]**.**We noted Resistance to all antibiotics in the 4 cases. CRP above 40 mg/l and neutropenia were constant in all patients. All of our patients had at least onepositive blood culture with the same germ. Transfontanellar ultrasound was normal in 3 patients and revealed ventriculitis in one newborn. On the therapeutic level, all our patients benefited from geographical isolation with the application of barrier measures and they were all treated by the combination of Meropenem and Amikacin, Ciprofloxacin was used in the patient presenting with ventriculitis, this same patient benefited from an external ventricular bypass. The average duration of treatment was 6 weeks. The seizures were treated with phenobarbital. Control lumbar puncture was performed in 2 patients and they were sterile with an interval of 8 days. The evolution was favorable in 3 newborns and we noted the death of a single case in the context of septic shock (low weight). The 3 surviving patients benefit from regular check-ups during development consultations in order to monitor their progress.

Appearance of ventriculitis on trans-fontanellar ultrasound

Discussion :

S. marcescens is a pathogen capable of colonizing the hospital environment, particularly intensive care units, with considerable capacity to develop intrinsic resistance against different families of antibiotics, hence the difficulty of its therapeutic management [3,4]. Until the end of the 20th century, S. marcescens was considered a non-pathogenic saprophytic organism, the first known outbreak of this bacteria was noted in 1951. Since then, infections with this organism have been reported with increasing frequency [5.6]. In the history of our service we have experienced 4 epidemics of this kind [7,8], the last and most important was between January and March 2023 with 32 cases including 4 cases of meningitis. Contaminated hands represent the major vector of its transmission. Others Sources of contamination have been reported in the literature: catheters, dialysis machines, Propofol and liquid soap [9-10].

Although this microorganism has relatively low virulence, it causes serious nosocomial infections in immunocompromised or critically ill patients, particularly in neonatal units [11,12]. S. marcescens infection an be located in several organs (keratitis, conjunctivitis, urinary and respiratory tract, surgical wounds and gastrointestinal tract), systemic location is the most common while meningeal waiting remains rare[13]. Recently several cases of cerebro-meningeal complications caused by S. marcescens have been reported, namely meningitis, brain abscesses and empyema. It is recommended to systematically perform brain imaging and more particularly transfontanellar ultrasound even in the absence of neurological signs [14]. The statistically significant risk factors for this infection reported in the literature are: low birth weight (less than 1,500 g), gestational age greater than 37 weeks and mechanical ventilation [4]. Other risk factors common to all nosocomial infections were illustrated: the length of hospitalization, the prescription of broad-spectrum antibiotics and the use of invasive therapeutic methods (umbilical catheter, intubation, bladder catheterization and parenteral nutrition). [15]. In our population all newborns were premature and 75% were artificially ventilated, the average weight recovered was 1750 g and 50% of newborns had an umbilical venous catheter. Therapeutically, preventive measures are essential for controlling the spread of this infection [16, 17]. For this, a certain number of measures were taken, in our department, from the diagnosis of the first case, in particular the raising awareness among medical and paramedical staff of the importance of hand hygiene, the use of double protection with gloves, the technical and geographical isolation of infected patients, and the disinfection of any surface or material likely to be contaminated. S. marcescens often presents high resistance to cephalosporins [18, 19]. the rate of resistance to cephalosporins was 100% in our series. The choice of antibiotic therapy differs depending on the results of the antibiogram; meropenem in combination with Amikacin started early gave satisfactory results in our unit. Ciprofloxacin was started in a patient who presented radiological signs of ventriculitis. Corticosteroids have no indication in neonatal meningitis because they do not modify mortality or neurological sequelae [20]. Phenobarbital has been used in the treatment of neonatal meningitis accompanied by seizures. In the study by Chemsi et al, it was used in 51% of cases with an average duration of 7 days [21]. Neonatal nosocomial meningitis has a terrible prognosis, despite the great progress made in diagnostic and treatment methods. The mortality rate of this infection varies from 14.3% to 62.5% of cases [7]. It is currently estimated between 6.6 and 13% in industrialized countries, compared to 20 to 30% in the 1990s [8]. In developing countries, this rate remains high, ranging from 27 to 58% [14, 15]. The high mortality of neonatal meningitis is explained by a certain number of factors which determine the prognosis: the diagnostic delay, the virulence of the germ, the gestational age and the precocity of the meningitis. Other prognostic factors must be taken into account such as vulnerability of the neonatal nervous system, immuno-incompetence, hypotrophy and neonatal distress [22,23]. The need for repeat lumbar puncture during treatment in a newborn with this type of meningitis has been debated. Some experts recommend a 2nd lumbar puncture routinely 48 hours after the start of treatment, while others suggest performing a 2nd lumbar puncture if clinical conditions have not improved after 24 to 72 hours of treatment. A multicenter retrospective study by Greenberg et al showed no significant difference in the mortality rate between two groups of newborns with confirmed bacterial meningitis, the first of whom received a single lumbar puncture while the second had two or more lumbar punctures [24]. In our patient Radiological monitoring was carried out in our patient every 15 days and a hearing screening was negative. We did not note any clinical or para-clinical abnormalities after 6 months of follow-up.

Conclusion:

Nosocomial S. Marcescens infections are beginning to become widespread in neonatal intensive care, often in epidemic form. We have experienced 4 episodes of this kind in our department. Meningitis caused by this germ is responsible for significant morbidity and mortality and poses a real problem of acquiring resistance to antibiotics. Early identification of patients with this type of meningitis and rapid implementation of control measures are essential to curb the spread of this severe infection. Short to medium and long term monitoring is necessary to detect neurosensory sequelae.

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