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EM CASE OF THE WEEK

BROWARD HEALTH MEDICAL CENTER DEPARTMENT OF EMERGENCY MEDICINE

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In the ED, we frequently see infants with the chief complaint of "fever". Since babies cannot verbalize their signs and symptoms, it is important for clinicians to recognize all the potential sources of infection and perform the proper work-up. This month we explore the facts about fever in a neonate or an infant and the proper steps that should be taken to diagnose and treat an infant with fever, with a specific focus on meningitis.

EM CASE OF THE WEEK

EM Case of the Week is a weekly "pop quiz" for ED staff. The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

FEVER IN AN INFANT (7-90 days of age)

A former full term 3-week-old female presents to the emergency department. The baby's mother states that the infant "will not stop crying," is not feeding well, and feels warm. The mother denies any signs of cough, congestion, respiratory distress, vomiting, or diarrhea. Vitals are remarkable for a temperature of 38.6°C (101.5°F). You perform a LP as part of the sepsis workup. The results are as follows: protein CSF is 100, glucose CSF is 20, 305 WBC, 2 RBC, few PMNs, and the CSF gram stain shows no growth. Which steps should you take?

A. Begin ampicillin and gentamicin

B. Check surface cultures

C. HSV PCR in CSF

D. Begin acyclovir

E. All of the above

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Take Home Points

*Meningitis is a life-threatening medical emergency; maintain a high index of suspicion for all signs and symptoms.

*Absence of meningeal signs in infants does NOT exclude meningitis. In this age group, such signs are often not present – when seen, usually represent a very late finding.

*Blood and CSF culture should be obtained prior to starting antibiotic therapy, but antibiotic therapy should not be delayed.

*If under 28 days old, obtain blood cultures, urine culture via catheterization or suprapubic tap, LP, and admit. Start ampicillin and gentamicin , +/- Acyclovir.

*The prevalence of SBI in febrile young infants ranges from 8% to 12.5% , higher (up to 20%) in neonates ≤28 days old.

*The most common sources of bacterial infection in infants <90 days of age with fever are urinary tract infection (72%), bacteremia (20%), soft tissue infection (13%), meningitis (6%) and pneumonia (4%).

Fever in a young infant

The correct answer is E. The baby's symptoms and CSF results are concerning for meningitis, either bacterial or viral. Antibiotics should be started empirically (after the LP is performed) due to the patient's age and because of the high risk of mortality if left untreated. Ampicillin and gentamicin provide empiric coverage for the bacterial organisms that are most common in this age group. There is also the possibility of viral meningitis. The recommendations for babies under 28 days is to check for HSV in the CSF through PCR and to check surface cultures. These patients should receive acyclovir empirically pending the results of bacterial CSF culture and HSV, CSF, and PCR.

BACKGROUND:

Fever is an important symptom of many disease processes in children and a common reason for emergency department visits. Neonates and young infants may manifest fever as the only sign of significant underlying infection. The incidence of serious bacterial infection (SBI) is higher in infants less than three months of age, particularly those under 28 days, than at any other time in childhood.

The standard for detecting fevers in infants less than three months of age is through a rectal temperature. A fever is defined as a temperature greater than 38°C. Although most febrile infants have a benign viral illness, the goal of evaluating fever is to identify the children who are at high risk for serious bacterial illnesses (bacteremia, UTI, meningitis, pneumonia) and those who will require hospitalization and further treatment.

HISTORY AND PHYSICAL

It is crucial to take a thorough history while evaluating fever in an infant. Important questions to address include: changes in behavior, feeding difficulties, sleeping patterns, associated symptoms, exposure to sick contacts, birth history, previous illnesses, etc. Specific findings to note on the physical exam include: abnormal vital signs, toxic appearance (such as irritiability, lethargy, poor tone), and any localized sources of infection. A bulging fontanelle classically presents late in the disease process.

Empirical treatment of suspected SBI in febrile infants less than 90 days of age*

Age	Most likely organism	Empiric treatment
Neonate - (≤28 days)	Common: Group B Streptococcus, E. coli Less common: Listeria monocytogenes, Enterococcus, S. aureus, other Gram negative organisms, Herpes simplex virus	Ampicillin & cefotaxime OR ampicillin & aminoglycoside¶ & acyclovir,Δ as indicated (see footnotes)
Infant - (29 to 90 days)	Common: S. pneumoniae, H. influenzae, N. meningiditis Less common: Group B Streptococcus, E. coli, S. aureus, Enterococcus, Listeria monocytogenes, Pseudomonas sp., other Gram negative organisms	**Well-appearing, no CSF pleocytosis:** Ceftriaxone OR cefotaxime **CSF pleocytosis or ill-appearing:** Vancomycin & ampicillin & ceftriaxone OR cefotaxime◇

* Broad spectrum coverage is prudent until an organism is identified.
¶ The choice of regimen should be based on local susceptibility patterns of E. coli and likelihood of L. monocytogenes infection.
Δ Acyclovir is indicated in infants ≤28 days with ill-appearance, mucocutaneous vesicles, seizures, or CSF pleocytosis.
◇ This regimen does not include an aminoglycoside and may not optimally cover infection with L. monocytogenes or resistant Gram negative organisms, especially when meningitis is present. Antibiotic therapy should be adjusted accordingly if infection with these pathogens is identified.

UpToDate

ANCILLARY STUDIES:

-WBC Count: A WBC count 5,000-15,000 is considered low risk
-Blood culture
-Urinalysis and urine culture: UTI is the most common source of infection in febrile infants, so this should always be performed.
-CSF studies: should be performed in infants with the following indications: age < 28 days, ill appearance, seizures, or high risk factors for bacterial infection. The CSF should be sent for cell count, glucose, protein, and bacterial culture. Viral studies should be sent if there is any concern for viral meningitis.
-Chest x-ray: A chest radiograph is helpful in identifying a source of infection in infants with at least one clinical sign of pulmonary disease. Keep in mind that even if a chest x-ray reveals pneumonia, it is most likely a viral etiology.
-Inflammatory markers: procalcitonin, C-reactive protein

EVALUATION AND MANAGEMENT

Neonates (7-28 days): All neonates with a rectal temperature > 38°C should have blood, urine, and CSF cultures performed regardless of clinical appearance. A chest radiograph should be obtained in those with any signs of pulmonary disease. They should be admitted to the hospital and treated with empiric antibiotics at least until cultures are negative at 48 hours.

The most common organisms that cause SBI in neonates include group B streptococcus, Escherichia coli, and Listeria monocytogenes. Ampicillin and cefotaxime or ampicillin and gentamicin are the recommended antibiotic regimen that will provide coverage for these organisms. The indications to add acyclovir for HSV coverage include: those who are ill-appearing, have mucocutaneous vesicles, maternal history of HSV, or seizures. Elevated liver enzymes may be an early indicator of disseminated HSV infection. The recommendations for babies under 28 days is to check for HSV in the CSF through PCR and to check surface cultures. These patients should receive acyclovir empirically pending the results of bacterial CSF culture and HSV/CSF/PCR.

Infants (29-90 days): Infants in this age group who are ill-appearing with temperature > 38.5°C have a higher risk of SBI. Full laboratory evaluation should include blood, urine, and CSF. Again, chest radiograph should be performed if there are any signs of pulmonary disease. Empiric antibiotic therapy for this age group consists of Ceftriaxone and Vancomycin. Ampicillin may be used to cover Listeria up to 6-8 weeks of age. Infants without CSF pleocytosis, a WBC count of 5,000-15,000, and a normal urinalysis are at low risk for a SBI and likely can be treated as an outpatient as long as they have reliable follow-up within 24 hours, at which time preliminary culture results can be reviewed.

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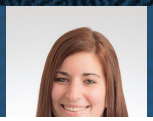

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This month's case was written by Nicole Shovlin. Nicole is a 4th year medical student from NSU-COM. She did her emergency medicine rotation at BHMC in April