

Cerebro Spinal Fluid Analysis in Childhood Bacterial Meningitis

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Abstract :

Introduction: The aim of this study was to analyze the lumbar puncture of all suspected cerebrospinal fluid (CSF) for suspected meningitis.

Methods: This study was undertaken in the department of Child Health, the Royal Hospital. The details of CSF of all files of the children who had undergone lumbar puncture for suspected meningitis from January 1, 2004 to December 31, 2004; were enrolled for the study.

Results: A total of 395 lumbar punctures were done to exclude bacterial meningitis. Out of the 142 CSF studies in neonates, 17 (12%) had the cytology suggestive of bacterial meningitis and 15 (88%) of them being culture positive. The commonest pathogen was Group B Streptococcus (70%). The bacterial antigens were positive only in 41% of the confirmed cases of bacterial meningitis, all being that of Group B Streptococcus and gram stain positivity in 45 percent of cases. In the 1- 3 months group all the 17 lumbar punctures were normal. Of the 179 lumbar punctures done in 3-18 months group, only 11(6%) were abnormal, 72% being culture

positive. Streptococcus pneumonia was the commonest organism (88%). Bacterial antigens were positive only in 2 of the 8 culture positive cases where gram stain was positive in 4 out of 8 cases. Irritability, lethargy and sick looking appearance were present in all the positive cases. None of the 28 children from 18 months to 5 years had abnormal CSF or positive CSF culture.

Conclusions: Based on the fact that only 7% of the 395 CSF studies were abnormal, we conclude that better clinical judgment and diagnostic criteria are warranted, before laying out guidelines for lumbar puncture to confirm or exclude the diagnosis of bacterial meningitis. Besides fever and convulsions as indicators for CSF studies clinical parameters such as irritability, lethargy and sick looking appearance are better indicators.

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Introduction

Bacterial meningitis in infants and children is a serious clinical entity with signs and symptoms that commonly do not allow to distinguish the diagnosis and the causative agents. Acute meningitis is a common infection, predominantly aseptic (82 – 90%), but when of bacterial origin (10-20%),^{1,2} it is infrequently associated with severe neurologically sequelae, especially when the diagnosis and treatment are late.^{3,4} As it is difficult to distinguish between bacterial and aseptic meningitis in the initial state, most authors have recommended rapid initiation of antibiotics in children with acute meningitis, with conventional therapy until cerebrospinal (CSF) culture results become available, 48-72 hours later.^{5,6} The pattern of bacterial meningitis and its treatment during neonatal periods may overlap, especially in the first one to three months old in whom group B streptococcus, Haemophilus influenza- type b, meningococcus and pneumococcus may all produce meningitis.⁷ In children more than 3 months of age H influenzae, Streptococcus pneumoniae, Neisseria meningitidis are the commonest causative organism of bacterial meningitis.

The aim of this study is to study the microbiological profile of CSF in childhood meningitis, over a period of one year.

Methods

This study was undertaken in Royal Hospital, department of Child health, by analyzing the files of all the children who had undergone lumbar puncture for suspected meningitis from January 1, 2004 to

December 31, 2004; the details of all the CSF were analyzed.

Results

A total of 395 lumbar punctures were done to exclude bacterial meningitis. Out of the 142 CSF studies in neonates, 17(12%) had the cytology suggestive of bacterial meningitis and 15(88%) of them being culture positive. The commonest pathogen was Group B Streptococcus (70%). The bacterial antigens were positive only in 41% of the confirmed cases of bacterial meningitis, all being that of Group B Streptococcus and gram stain positivity in 45 percent of cases. In the 1- 3 months group all the 17 lumbar punctures were normal. Of the 179 lumbar punctures done in 3-18 months group, only 11(6%) were abnormal, 72% being culture positive. Streptococcus pneumonia was the commonest organism [88%]. Bacterial antigens were positive only in 2 of the 8 culture positive cases where gram stain was positive in 4 out of 8 cases. Irritability, lethargy and sick looking appearance were present in all the positive cases. None of the 28 children from 18 months to 5 years had abnormal CSF or positive CSF culture.

Discussion

In healthy children, the three most common organisms causing acute bacterial meningitis are S.pneumoniae, N Meningitidis, and Haemophilus influenza type b (Hib).⁸ Although Hib is the

commonest causative agent, with the availability of Hib conjugate vaccine, the current likely hood of Hib meningitis in a child who has received at least two doses of vaccine was extremely rare.⁸ Lumbar puncture is the gold standard for the diagnosis and should be done in all suspected cases of meningitis unless contraindicated.⁹ It helps to distinguish the microbial etiology of meningitis and encephalitis, and to rule out non-infectious causes of disease. The myth about lumbar puncture complications among parents has to be resolved by the physician in order to get the consent to do the procedure

Development of bacterial meningitis progress through the following steps:

- (1) bacterial colonization of the nasopharynx
- (2) mucosal inflammation and penetration into the blood stain
- (3) intravascular multiplication and entrance through the blood brain barrier.
- (4) generation of inflammation within the subarachnoid space
- (5) neuronal cell injury and auditory nerve damage.

Children with bacterial meningitis present in one of the following pattern:

- (1) the most common, and insidious form with non specific symptoms that progress over 2 to 5 days before meningitis is diagnosed.
- (2) a more common rapid form, in which symptoms and signs of meningitis progress over one or two days.
- (3) a fulminant course, with rapid deterioration and shock early in the course of illness.

*Host and bacterial factors influence of type presentation.*⁸

In infants the symptoms consist of fever, nausea vomiting, irritability and diarrhea.¹⁰ Grunting respiration indicate critically ill child. Older children complain of headache, vomiting, back & neck pain, photophobia and altered sensorium. Convulsions are noted in 20 to 30 % of patients early in the course of disease in pneumococcal and Hib meningitis.

On physical examination, the fontanel of an infant may be bulging, presumably indicating increased intra cranial pressure; this sign is neither highly sensitive nor specific for meningitis but always requires evaluation. Most specific physical findings of meningitis are Kernig's and Brundenzki sign and neck stiffness. Papilledema is uncommon in a child with an uncomplicated meningitis and if present, suggest another cause such as subdural effusion, brain abscesses etc

10. Petechial or purpuric rash and shock are classically associated with meningococcal meningitis but also can be occasionally caused by H Influenza or S.pneumoniae.^{11,12}

In our study it was not found that H influenza, as the causative agent in any case, indicating that introduction of Hib vaccination

in to the immunization schedule has yielded good results. This also underlies the fact that introduction of pneumococcal vaccine can certainly reduce the morbidity and mortality of meningitis in Oman. Out of the 28 positive results noted in below 18 months of age neck rigidity was noticed only in one case and in that case, the total CSF count was more than 10,000/cu mm which points that in younger age group neck rigidity is a very late sign and one should look for other nonspecific signs. Gram stain was a better tool to find out the causative agent except in Group B Streptococcus.

Conclusion

Based on the fact that only 7% of the 395 CSF studies were abnormal, we conclude that better clinical judgment and diagnostic criteria are warranted, before laying out guidelines for lumbar puncture to confirm or exclude the diagnosis of bacterial meningitis. Besides fever and convulsions as indicators for CSF studies clinical parameters such as irritability, lethargy and sick looking appearance are better indicators of meningitis, especially below 18 months of age.

Gram stain is a better tool to find out the causative agent in the initial stage than Bacterial antigen assay in identifying the organism in culture negative CSF except in Group B streptococcal meningitis.

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