

Comparison of Childhood Aseptic Meningitis with Bacterial Meningitis in a Tertiary Children's Hospital of Taiwan

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during 2007-2014 were reviewed. The study was approved by Institutional Review Board of the hospital.

Patients with aseptic meningitis were recruited as who had pleocytosis but negative bacterial growth in CSF. CSF pleocytosis of aseptic meningitis was defined as to be >10 leukocytes/ mm^3 in neonates and >5 leukocytes/ mm^3 for others. While those with bacterial meningitis were recruited only who had positive CSF bacterial culture results. Traumatic tapping (erythrocytes $>10000/\text{mm}^3$), contaminated cultures, or having received previous intravenous antibiotic therapy were excluded. Patients with sepsis (positive blood bacterial culture report) or other site bacterial infections occurred before neurological symptoms/signs appeared were excluded. Patients who had apparent lesions of the brain in the beginning of the disease process, detected by brain sonography, computed tomography, magnetic resonance imaging or electroencephalography, were regarded as having encephalitis and were excluded.

In patients suspected to have meningitis, their CSF was collected for examining cytology, glucose and protein content, Gram stain, and bacterial culture. In some patients who were more likely to be aseptic meningitis, detection of viral pathogens in CSF might be performed by CSF viral culture or polymerase chain reaction (PCR).

The patients' clinical presentations, laboratory data, pathogens, treatment, hospitalization days, and outcomes were reviewed and analyzed. According to the final diagnosis and the results of this study, aseptic and bacterial meningitis patients were compared.

SPSS and adapted chi-square or Fisher's exact test were used for statistics analysis. Test of Normality by Kolmogorov-Smirnova was applied for laboratory data and hospital duration. P value less than 0.05 was regarded as statistical significance.

Results

Gender and age

A total of 141 patients were enrolled as aseptic meningitis and 56 patients as bacterial meningitis. Around two-thirds of patients were

male in both aseptic and bacterial meningitis groups (66.0% and 64.3%). The average age of aseptic meningitis is 5.7 years of age and bacterial meningitis is 1.6 years. Aseptic meningitis occurred more in older than one-month-old children ($p < 0.001$). Most patients in aseptic group were children, but in bacterial group were neonates (Table 1).

| Characteristics | | Aseptic group | Bacterial group | p value |
|-----------------|-------------------|---------------|-----------------|---------|
| Sex | female | 48 (34.0%) | 20 (35.7%) | 0.824 |
| | male | 93 (66.0%) | 36 (64.3%) | |
| Age | <1m/o | 20 (14.2%) | 31 (55.4%) | <0.001 |
| | 1m/o ~ 1y/o | 33 (23.4%) | 14 (25.0%) | |
| | 1y/o~7y/o | 37 (26.2%) | 6 (10.7%) | |
| | 7y/o | 51 (36.2%) | 5 (8.9%) | |
| Outcome | complete recovery | 136 (100.0%) | 30 (54.5%) | <0.001 |
| | death | 0 (0.0%) | 6 (10.9%) | |
| | sequelae | 0 (0.0%) | 19 (34.5%) | |

Pathogens

Forty-nine (34.8%) of the aseptic meningitis patients did not perform CSF viral study, and only 36 (25.5%) patients found viral pathogens. The most common pathogen in aseptic meningitis group was echovirus (23 patients, 16.3%), followed by parainfluenzavirus (7 patients, 5.0%), coxsackievirus (3 patients, 2.1%), and enterovirus 71 (3 patients, 2.1%). The patients diagnosed enterovirus type 71 (EV71) were done by serum EV71 rapid test, rectal and/or throat swab PCR. Except enteroviruses, there were no other viral pathogens.

The most common pathogens of bacterial meningitis was group B

of maternal screening and intrapartum prophylaxis policy [8]. However, the situation of aseptic meningitis is quite different.

Among aseptic meningitis, enteroviruses are the most common cause [9]. Other frequently mentioned pathogens include herpesviruses, mumps, arboviruses, etc [11]. Nonetheless, we did not find other viral pathogens in this study. The reason may be due to the exclusion of the encephalitis cases and the high immunization rate in Taiwan, i.e. polio vaccine, measles, mumps, rubella vaccine, varicella vaccine and Japanese B vaccine. Typical manifestations of enteroviral

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