Meningoencephalitis Bacterial DD Viral with Organic Mental Disorders

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Meningoencephalitis is inflammation that occurs in meninges and brain tissue. Symptoms encephalitis include fever, seizures, decreased consciousness. Meningoencephalitis can be caused by viral, bacterial, spirochete, fungal, protozoan infections. Based MSCT radiology examination head with coronal and sagittal slices reformatted axially with contrast, first result showed no infarction, bleeding, mass pressure effects on brain parenchyma, mild brain edema, second result no visible hypo/hyperdense lesions in sulci and gyri of brain parenchyma, slight thinning visible, ventricular system and cisterna normal, pons and cerebellum normal, there is no abnormal calcification visible and visible midline deviation, orbita, mastoid, right with left paranasal sinuses and calvaria is not visible. Normal, no osteolytic or osteoblastic processes visible. Based microbiological examination urine, cerebrospinal fluid with gram staining and aerobic culture as well as sensitivity testing, results showed that no aerobic or anaerobic germs were found. Laboratory examination, WBC > 12 103/µL, procalcitonin 0.163 ng/ml, CRP 6.22 mg/dl, based laboratory examinations which exceeded normal limits experienced by patient, inflammation and infection. Empiric antibiotic therapy for bacterial meningoencephalitis can use fluoroquinolones or cephalosporin ceftazidime, based good BBB penetration. Procalcitonin examination, blood culture, and lumbar puncture were performed again. Diagnosis meningoencephalitis is viral, then acyclovir in form injection used.
Keywords: Meningoencephalitis, Organic mental disorders, Leukocytosis, Hematemesis

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1. Introduction

Meningitis is an inflammation that affects the three layers of protective membranes that cover the brain and spinal cord, called the meninges. The outer layer of the meninges is called the dura mater, followed by the arachnoid mater and pia mater [1]. Encephalitis is inflammation of brain tissue which can be caused by various microorganisms such as bacteria, viruses, parasites, fungi, and rickettsia. Meningoencephalitis (ME) is inflammation in the meninges and brain tissue. In general, the symptoms of encephalitis include fever, seizures, and decreased consciousness. This disease can be found at all ages, from children to adults [1].

Meningoencephalitis can be caused by viral infections, where the viruses that cause meningitis are in principle enterovirus viruses which include coxsackieviruses, echoviruses, and in unvaccinated patients (*poliovirus*). Enteroviruses and arboviruses *(St. Louis, LaCrosse, California encephalitis viruses*) are the viruses that most often cause meningoencephalitis. Besides, viruses that can cause meningitis are HSV, EBV, CMV lymphocytic choriomeningitis virus, and HIV [2].

Organisms that commonly cause meningitis (such as *N. meningitidis, S. pneumoniae, H. influenzae*) consist of a polysaccharide capsule which makes it easy for them to colonize the nasopharynx of healthy children without systemic or local reactions. Viral infections can arise secondary to penetration of the nasopharyngeal epithelium by these bacteria. Apart from that, through the blood vessels, the

polysaccharide capsule causes bacteria not to undergo the opsonization process by the classical complement pathway so that the bacteria are not phagocytosed [2].

In the pathogenesis of bacterial meningitis, there is a bacterial phase where in this phase the bacteria begin to penetrate the cerebrospinal fluid through the choroid plexus. The cerebrospinal fluid does not respond well to infection because complement levels are low and only certain antibodies can penetrate the blood- brain barrier. The walls of gram-positive and negative bacteria consist of pathogenic substances that can trigger an inflammatory response. Teichoic acid is a pathogenic substance in gram-positive bacteria and lipopolysaccharide or endotoxin in gram-negative bacteria. When bacterial cell walls lyse, these pathogenic substances are released into the cerebrospinal fluid [2].

Common clinical manifestations of encephalitis are fever, headache, and decreased neurological function. Decreased neurological function includes altered mental status, focal neurological function, and seizure activity. These findings can help identify the type of virus and prognosis. For example, due to West Nile virus infection, signs and symptoms are nonspecific and include fever, malaise, periocular pain, lymphadenopathy, and myalgia. Additionally, there are several unique physical findings including a maculopapular, erythematous rash; proximal muscle weakness, and flaccid paralysis [2].

2. Methods

A 41-year-old male presented to our patient referred from X Hospital Surabaya to Y Hospital Surabaya with a diagnosis of brainstem infarction stroke. The patient had sudden vertigo three days earlier when he woke up from a nap without nausea and vomiting, then the day before the patient was referred the patient suddenly became unconscious and had difficulty communicating with him. The patient's condition does not include fever, shortness of breath, or cough. There is no gastrointestinal bleeding, and both defecation and urination are within normal limits. The patient experienced decreased consciousness, up and down (*fluctuating*), shouted several times, but did not go into a rage, could open his eyes spontaneously but without contact, had difficulty communicating, and could follow instructions well.

3. Results

Based on the Thorax AP radiology examination, the COR results were large and the impression was normal, the lungs did not show tracheal infiltration in the middle, the right and left phrenicocostal sinuses were sharp, the right and left hemidiaphragm looked good, the bones looked good and the soft tissue showed no abnormalities. On the following day, an MSCT examination of the head with axial reformatted coronal and sagittal slices with contrast was carried out. The first result was that there were no visible infarctions, bleeding, or mass pressure effects on the brain parenchyma, mild brain edema.

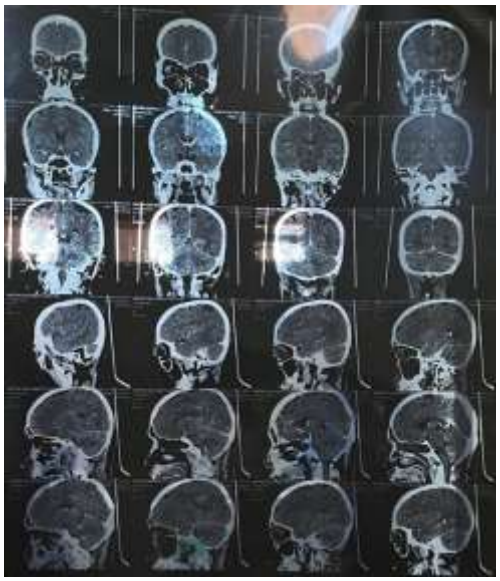

Fig. 1. Head CT Scan Without Contrast

Based on the above examination, it supports the picture of meningoencephalitis, there is no visible infarction, bleeding, or mass in the brain parenchyma. Based on microbiological examination of urine, cerebrospinal fluid (CSF/LCS) with gram staining and aerobic culture along with sensitivity tests, the results showed that no aerobic and anaerobic forms of germs were found.

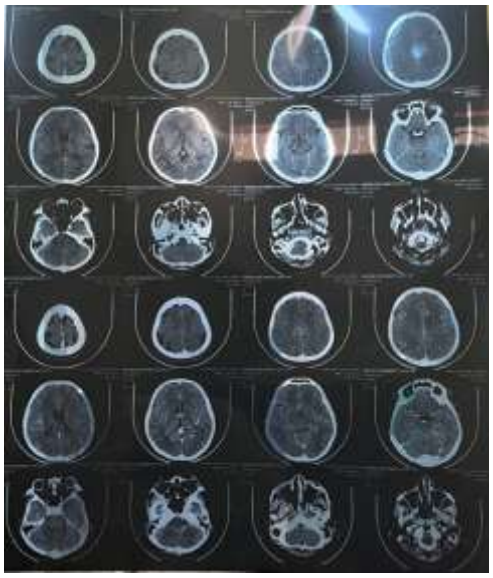

Fig. 2. Head CT Scan Without Contrast

For the treatment of bacterial meningoencephalitis at the beginning of treatment the patient used ceftriaxone at a dose of 2x2 grams. This is following PPAB prophylaxis (Guidelines for the Use of Anti-Biotics) and therapy at Dr. RSUD. The antibiotic used as empiric therapy for patients suffering from bacterial meningoencephalitis is ceftriaxone 2x2 grams and if the patient is allergic to penicillin, moxifloxacin 400 mg per 24 hours can be given [3]. Even though the causative diagnosis has not been established, immediate administration of antibiotics is highly recommended (*grade A*) in patients who are thought to have bacterial meningoencephalitis, even though the lumbar puncture examination and diagnosis have not been established [4]. And according to Perdossi guidelines, the empirical antibiotic given is ceftriaxone [5].

After treatment with ceftriaxone for 8 days, the patient's clinical condition did not improve, the patient's leukocytes rose to 16,820 µL and the patient was still restless. So the patient's antibiotic was replaced with cefperazone sulbactam. The dose used is 2x2 grams. For empirical therapy in brain and central nervous infections, cefoperazone sulbactam is not appropriate, because, with beta-lactamase inhibitors (clavulanate, sulbactam, tazobactam), it has low penetration into the CNS [6]. And according to experiments, cefoperazone is a cephalosporin-assisted antibiotic where penetration into the Blood Brain Barrier (BBB) is weak, so the concentration that can penetrate the BBB does not meet the MIC required for inhibit or kill bacteria [7].

Cefoperazone sulbactam with a single dose of 3 grams intravenously in CSF can produce MIC50 for Acitenobacter baumannii bacteria and MIC100 for E. coli bacteria, but this was found in trials given to patients who had undergone craniotomy surgery and implantation [8]. EVD (*External Ventriculous Drain*) penetration in CSF is 28-37% [9]. In this case, the patient has never had surgery on his brain so penetration of this antibiotic will be more difficult. So the concentration required in CSS will not be sufficient to reach the MIC.

For antibiotics, it is recommended to use fluoroquinolones such as ciprofloxacin or moxifloxacin in accordance with the PPAB at RSUD Dr. Soetomo, but side effects must still be monitored. Or for the cephalosporin group, you can use ceftazidime, which penetrates the BBB better than other cephalosporins [7], and it is also recommended to carry out a culture examination with a blood specimen and another lumbar puncture examination.

The patient also seemed to have meningoencephalitis caused by a viral infection, so he was treated with acyclovir at a dose of 5x800 mg. The use of acyclovir tablets for the treatment of viral meningoencephalitis is not appropriate, because the bioavailability of acyclovir is only 26% [10]. For the treatment of viral meningoencephalitis, it is recommended to use an intravenous injection form at a dose of 10-15 mg/KgBW for 14-21 days [11].

Treatment of viral meningoencephalitis is also recommended using oral valacyclovir if acyclovir injection is not possible. Oral valacyclovir at a dose of 1 gram per 8 hours can provide inhibition against 83% of HSV 1 strains and at a dose of 2 grams per 8 hours can inhibit VSV. Based on its pharmacokinetic profile, valacyclovir can achieve CSS at doses comparable to injectable acyclovir [10]. However, when using high doses of valacyclovir, attention must be paid to the surrounding effects which can cause kidney function disorders because most of it is in the urine. The patient was given dexamethasone therapy at a dose of 5 mg per 8 hours intravenously. Dexamethasone in cases of bacterial meningitis aims to prevent the inflammatory response resulting from bacteriolysis by antibiotics [4]. Dexamethasone is highly recommended at the same time as administering the first dose of antibiotics, or no later than 4 hours after administering the first dose of antibiotics. In a Cochrane study, corticosteroids could reduce hearing loss and neurological symptoms in bacterial meningitis patients, but did not reduce mortality rates [4].

The recommended dose of dexamethasone for adults in patients with bacterial meningitis is 10 mg per 6 hours for 4 days [4][5]. In this case the patient was given dexamethasone injection at a dose of 5 mg per 8 hours then reduced to 5 mg per 12 hours (*tapering off*). Dexamethasone therapy was given for 8 days. Tapering off is not necessary if the use of dexamethasone is less than 14 days and reducing the dose can be adjusted according to the patient's clinical condition. In general, the dose can be reduced by 25-50% every 4 days [12].

The patient experienced hematemesis when he was admitted to the hospital and could be treated by administering omeprazole injection therapy with a loading dose of 80 mg which was then given intravenously at a dose of 40 mg per 12 hours. The patient no longer experiences hematemesis or melena,

omeprazole injection is still given for maintenance purposes and to prevent recurrence of hematemesis or stress ulcers in patients with critical illness [13].

The dose of omeprazole used is appropriate, namely, a loading dose of 80 mg at a speed of 8 mg per hour then followed by a maintenance dose of 2x40 mg. But for a maintenance dose, a dose of 40 mg per 24 hours should be sufficient [14]. So in this case we recommend reducing the dose of omperazole to 40 mg per 24 hours while continuing to monitor the patient's hematemesis. And for administration, omeprazole provides better outcomes when given as an intermittent infusion compared to bolus administration [15].

The patient screamed several times but did not go berserk, the patient also became restless. The patient was consulted to a mental health specialist and found that he was in acute delirium, possibly due to a physical illness that disrupted brain function. The suggestion is to give 0.5 mg haloperidol therapy every 24 hours at night. If you are still anxious, you can give an intramuscular injection of 1/2 amp (2.5 mg) haloperidol [16]. By administering haloperidol regularly every 24 hours, patients can calm down and sleep well. The patient's organic mental disorders may be due to the patient's meningoencephalitis, resulting in damage to several of the patient's nerve functions. Haloperidol therapy of 0.5 mg per 24 hours in patients is appropriate. It should be avoided to give excessive amounts of antianxiety to patients because this will make it difficult to assess the patient's GCS and nerves.

4. Conclusion

Giving ceftriaxone as empiric therapy for bacterial meningoencephalitis is appropriate, however empirical placement of cefoperazone sulbactam therapy is not appropriate, because the penetration of the BBB is poor. Viral meningoencephalitis therapy using oral acyclovir is inappropriate because its bioavailability is only 26%. The duration of injectable dexamethasone for bacterial meningoencephalitis is less than optimal. The loading dose when administering omeprazole is appropriate, only the maintenance dose given is less than optimal. Organic Mental Disorder Therapy with haloperidol is appropriate.

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