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Case Report

Advanced radiology method for monitoring progressivity of paediatric meningoencephalitis: a case report

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Abstract

Background Meningoencephalitis in children was usually related to upper airway infection. Late presentation of pediatric cases poses a challenge in exploring the etiology. Advance method such as MRI might support in monitoring the disease progressivity, although its utilization is typically reserved for complicated cases.
Objective To describe the utilisation of CT and MRI in paediatric meningoencephalitis patient admitted to Bethesda Hospital, Yogyakarta
Case description a 7-year-old female child presented with refractory seizures within 24 hours, each last over 3 hours. All physical examination was consistent with meningeal involvement. Concurrent Head CT-scan and MRI showed infarction and frontal hygroma. Follow-up imaging showed improvement
Conclusion The CT-Scan and MRI should be used to confirm the diagnosis and complication of meningoencephalitis in children.

Keywords: meningoencephalitis, X-ray computed tomography, magnetic resonance imaging, child

Introduction

Meningoencephalitis is inflammation both of the meninges and brain. Meningitis could be caused by several microorganisms, such as viruses, bacteria, parasites. Meningitis due to viruses and bacteria are the most common.[1] In addition, bacterial meningitis can be fatal if not treated effectively. A global research shows that meningitis causes 318,400 deaths worldwide. The incidence rate varies from country to country. In Indonesia, the incidence of meningitis is 78.018 and the mortality case is 4313, has declined. The disability- adjusted life- year (DALY's) indicating that the contribution of mortality to meningitis burden is far greater than the contribution of disabling outcomes.[2]

The distribution of bacterial meningitis varies among age group. A higher incidence is found among younger age group, mainly neonates and children. Group B Streptococcus and E. coli were the main causative organisms in neonates, while Streptococcus pneumoniae and enterovirus were mainly found in older children.[3] These pathogenic microorganisms usually colonizes the mucosa of nasopharyngeal mucosa, cause further progression to bacteremia and penetrate to the blood-brain barrier via intercellular and transcellular.[4] In this case report the meningoencephalitis and further brain complications were detected by Computed Tomography (CT) Scan and Magnetic Resonance Imaging (MRI).

Case Description

Patient Information

A 7-year-old girl patient came to Bethesda Hospital Yogyakarta on September 27, 2020, complaining of seizures. Seizures in the patient recurred within 24 hours, and seizures lasting over 3 hours. The patient had a history of fever, vomiting, cold and sore throat since Saturday, September 19, 2020.

Diagnostic assessment

The patient underwent CT scan of the head without contrast on September 24, 2020. The CT-Scan revealed a mucosal thickening of the maxillary sinus, and concluded of rhinosinusitis. The CT-Scan also found signs of cerebral edema, which supported the suspicion of meningoencephalitis.

Figure 1(a) shows a mucosal thickening in the anthrum

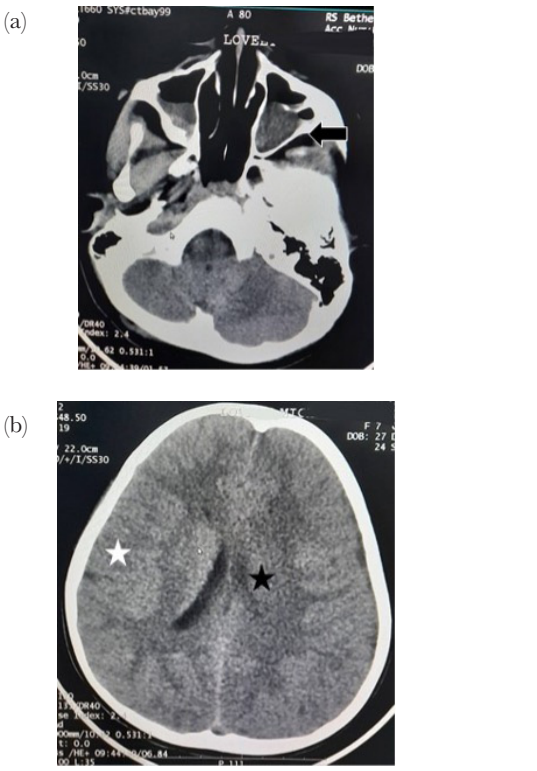

Figure 1. *The axial non contrast CT scan of the head on September 24, 2020, showed the mucosal thickening of the maxilla anthrum (arrow) and nasal cavity (a) and the sign of cerebral edema (b) like narrowed ventricles (black asterisk) and less prominent sulcus and gyrus (white asterisk)*

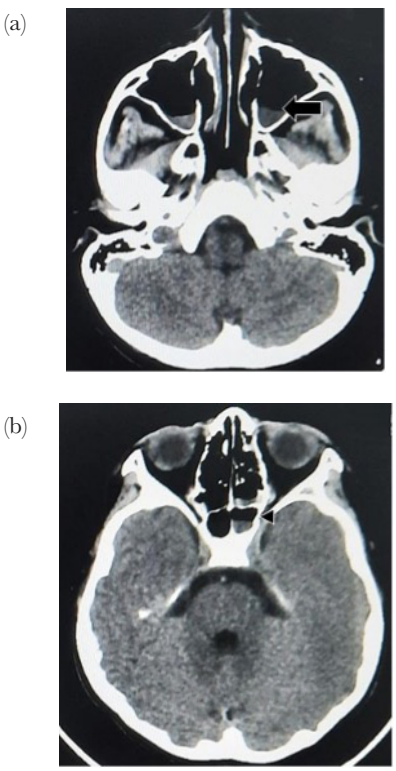

Figure 2. *The axial non contrast CT scan of the head result on September 28, 2020, with a reaction of the maxillary sinus mucosa (arrow) (a) and signs of spenoiditis (arrowhead) (b)*

maxilla and nasal cavity which can be suspected of rhinosinusitis. Cerebral edema is shown in Figure 1 (b) with narrowed ventricles, less prominent sulcus, and cortical gyrus

Therapeutic intervention

The patient were given intravenous treatment, including mannitol, ceftriaxone, methylprednisolone, and phenytoin in Bethesda Hospital. The patient has conducted head MRI examination on October 5, 2020. The result was hygroma subdural in left temporoparietalis, mucosal thickening in maxilla sinus, and there is no infarct in left frontal lobe. After some treatments, the patient can move his right hand and feet.

Follow-up

The patient came back to Bethesda Hospital Yogyakarta on September 27, 2020 and was hospitalized. The patient had physical examinations. We found miosis of pupil, nuchal rigidity, hemiparesis right side and motoric aphasia. The patient was subjected to a second head CT-Scan on September 28, 2020 and the following results were 2020. On the axial brain MSCT without contrast, it shows bilateral paranasal sinuses that show signs of sphenoiditis and maxillary sinus mucosal reactions. These results can support sinusitis in patients

The second of head CT scan showed hypodense in the left frontal lobe with a thin subdural hygroma on the left pericalvaria. Hypodense appearance may indicate infarction of the left frontal lobe. In addition, on the CT scan of the head, there were no signs of cerebral edema as in the previous examination as shown in Figure 3.

On September 29, 2020 the patient had cerebrospinal fluid examination. The leukocyte count increased to 51 / uL and a low glucose count of 43.6 mg / dL, which can support the diagnosis of bacterial meningitis. The microscopic examination of Acid Fast Bacilli (AFB) in the cerebrospinal fluid specimens were negative.

Discussion

Bacterial meningitis in children and adults is often preceded by upper respiratory diseases. The clinical manifestations found in meningitis are fever, headache, nuchal rigidity. Other symptoms that can be encountered are chills, sweating, loss of appetite, photophobia. The next symptoms that can occur are hydrocephalus (accumulation of fluid in the brain), paralysis of one side of the body, seizures, and other neurological disorders.[5]

Meningitis is an emergency condition, so the action to perform a CT Scan of head can be done before examining the cerebrospinal fluid through a lumbar puncture.6 The European Society for Clinical Microbiology and Infectious Diseases (ESCMID) guidelines for diagnosing and

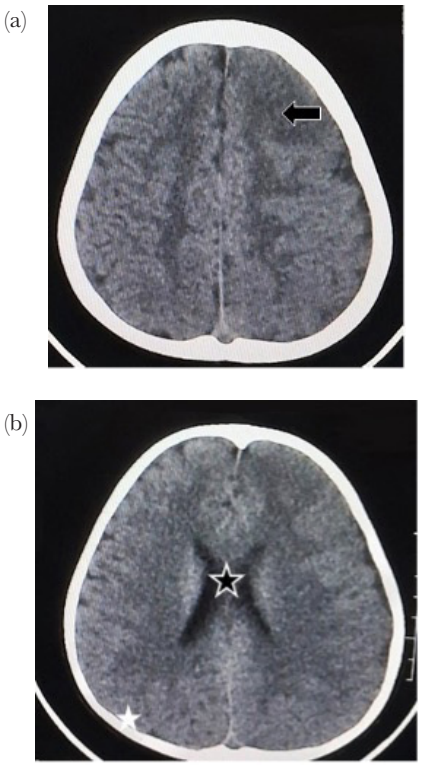

Figure 2. *The axial non contrast CT scan of the head result on September 28, 2020, with a reaction of the maxillary sinus mucosa (arrow) (a) and signs of spenoiditis (arrowhead) (b)*

managing of meningitis recommend examining the cranial image before lumbar puncture in patients with focal neurological deficits, new-onset seizures, altered mental status or Glasgow Coma Scale score <10. The guidelines from The Infectious Disease Society of America (ISDA) also recommend neuroimaging in patients with acute bacterial meningitis with GCS <15, pupil dilatation, new-onset seizures, immunocompromise.[4]

Neuroimaging can identify predisposing factors for meningitis, such as patients with sinus or mastoid infections, head trauma, cranial fractures and congenital anomalies. In addition, neuroimaging can identify and monitor complications from meningitis such as hydrocephalus, abscess, cerebritis, thrombosis, infarction, ventriculitis, subdural effusion, empyema, hygroma.[9]

The results of the CT scan of the head are not specific for the diagnosis of meningitis, but it is reported that the sulcus is thinning, the ventricles are narrowed. On post-contrast MRI, a thin and linear leptomeningeal enhancement was found. If smooth or linear enhancement shows the characteristics of bacterial meningitis. When the enhancement is nodular and thick indicates leptomeningeal carcinomatosis or granulomatous. Early diagnosis is essential in order to provide effective treatment.[7,8]

The therapy given to meningitis is antibiotics. First-line antibiotics are given as soon as possible, ceftriaxone 100 mg/kg IV drip /time for 30 to 60 minutes every 12 hours or cefotaxime 50 mg/kg / time IV every 6 hours. Second-line antibiotics can be given chloramphenicol 25 mg/kg/ times IM (or IV) every 6 hours and ampicillin 50 mg/kg/ times IM (or IV) every 6 hours. If the diagnosis is certain, treatment can be given parenterally for at least 5 days and followed by five days of treatment if there is no impaired absorption. If there is impaired absorption, then all treatment is carried out parenterally and the total length of treatment is ten days. If there are complications such as seizures, phenobarbital therapy can be given 20 mg/kg IV within 5 minutes, if the seizure continues, phenobarbital 10mg/kg can be added to a maximum of 40mg/kg. If the seizure continues, phenytoin 20 mg/kg IV can be given in a physiological saline solution at a rate of 1 mg/kg/minute.[1]

The patient has a history of cold and CT scan images support these symptoms as rhinosinusitis. Infection of the sinuses is a predisposing factor for meningitis, due to the anatomical location of the sinuses adjacent to the central nervous system. Neuroimaging studies of meningitis can identify predisposing factors of meningitis. Inflammation of the central nervous system can cause cerebral edema.9

Complications from meningitis that can occur are hydrocephalus, cerebral abscess, thrombosis, infarction, ventriculitis, subdural empyema, subdural hygroma. These complications can be identified by neuroimaging.[8] In this patient, a CT scan of the head showed hypodense in the left frontal lobe with a thin subdural hygroma on the left pericalvaria. Hypodense appearance may indicate infarction of the left frontal lobe. This is a complication of meningitis. Inflammation of the subarachnoid space causes cerebral edema and cerebral vasculitis resulting in cerebral infarction.[9] The CT scan of the head without contrast supports the symptoms experienced by the patient, namely seizures and left hemiparesise.

The result of magnetic resonance image on October 5, 2020, after the patient got therapy is thin hygroma subdural. There was no infarction in frontal lobe like in result head CT Scan on September 28, 2020. The patient also able to move right hand and leg. It was shown that the therapy that given to the patient is adequate.

A subdural hygroma is the collection of cerebrospinal fluid in the subdural space. They can be caused by leakage of CSF following minor trauma in the setting of cerebral atrophy, following meningitis in children. The factors contributing to the development of subdural hygroma are unknown, but there is probably an underlying disturbance of normal CSF absorption or an alteration of the dynamics of CSF circulation. A previous study showed that subdural hygroma was associated

with meningitis in children and most often these resolve spontaneously.[9]

Conclusion

Meningoencephalitis is a disease characterized by infection and inflammation of the meninges and brain. Neuroimaging in pediatric patients with meningoencephalitis can identify predisposing factors and identify complications of meningitis. In this case, the predisposing factor is multiple sinusitis. The complication is infarct in left frontal lobe and subdural hygroma. Adequate therapy for meningoencephalitis in 7 years old children can improve the clinical condition.

Conflict of Interest and Funding Resource

The authors stated no conflict of interest.

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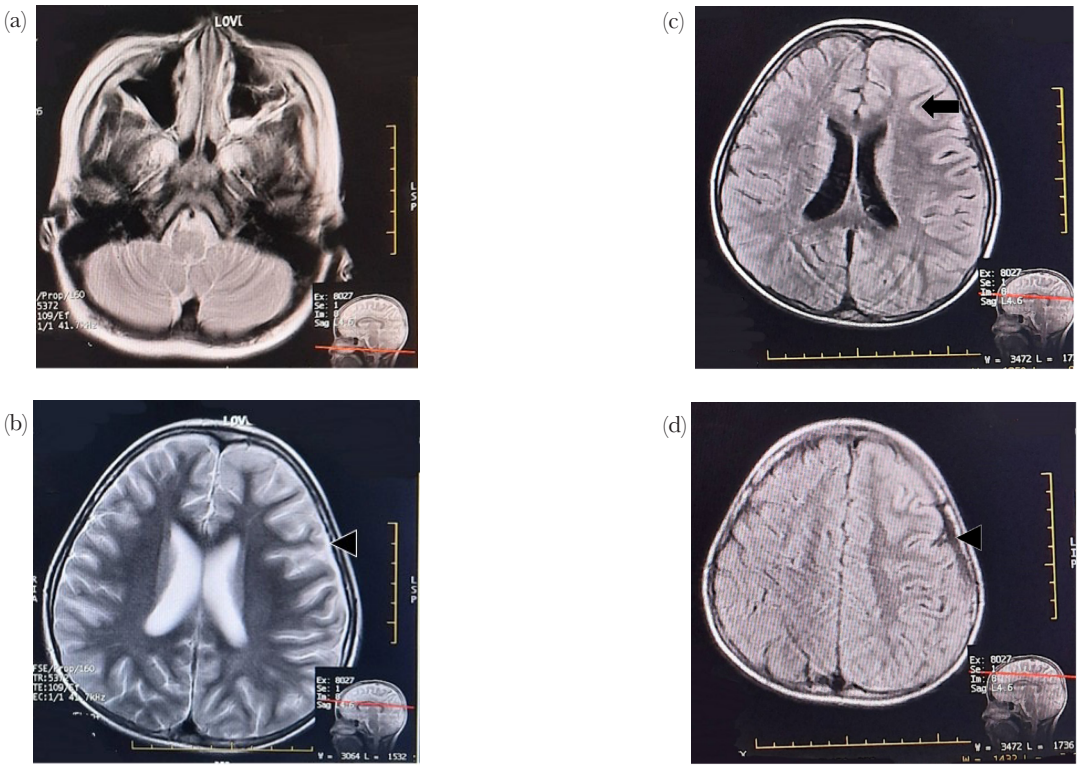

Figure 4. *The T2 weighted axial magnetic resonance image of the head shows mucosal thickening in maxilla sinus (arrow) (a) and hygroma subdural in left temporoparietal (arrowhead) (b). The axial FLAIR magnetic resonance image shows no infarction in the left frontal lobe (arrow) and thin hygroma subdural in the left temporoparietal (arrowhead) (c,d)*