CASE REPORT

NAEGLERIA MENINGOMYELOENCEPHALITIS

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Abstract. A case of primary amebic meningoencephalitis (PAM) with severe spinal cord involvement was documented in a 12 year-old boy from Samut Prakan Province, Thailand. This is the first reported case of *Naegleria* meningomyeloencephalitis in Thailand. He had a history of swimming in the canal nearby his house prior to the fever, headache and convulsion which rapidly progressed into a comatose state. PAM was only detected at post-mortem. The findings included suppurative exudates and necrosis of the olfactory bulbs and the basal parts of the frontal, temporal lobes, pons, cerebellum, medulla and the spinal cord. Numerous *Naegleria* trophozoites were present in the brain and spinal cord. Foci of neuronal degeneration and demyelination were noted.

The usual primary amebic meningoencephalitis (PAM) is a fatal disease caused by an ameboflagellate, *Naegleria fowleri*. About 150 cases have been documented since the first human infection was reported in 1965 (Fowler and Carter, 1965) and only six documented cases survived (Wang *et al*, 1993). The usual pathological changes in primary amebic meningoencephalitis are tissue damage of the brain including the base of the frontal and temporal lobes, hypothalamus, midbrain and pons, specially olfactory bulbs in association with mixed leukocytic reaction (Gutierrez, 1990). There were only two cases of spinal cord involvement ever reported in the English literature (Duma *et al*, 1971). This report represents a rare cases of severe involvement of spinal cord in primary amebic meningoencephalitis first recognized in Thailand.

The patient was a 12 year-old boy from Samut Prakan Province. He presented with fever and headache for two days. There was associated nausea and vomiting. On the day of admission, he became drowsy. He was brought to a private clinic where neck stiffness was detected and was subsequently referred to Ramathibodi Hospital. The familial medical history and the past illness were not remarkable. The patient's family lived near a canal in Samut Prakan where he frequently swam.

The pertinent physical examination revealed fever of 38.5°C, blood pressure of 110/40 mmHg, pulse rate of 100/minute, and respiratory rate of 24/minute. He was drowsy and responded only to verbal commands. There was stiffness of the neck. The fundoscopic examination was unremarkable. Results of other physical examination were within normal limits.

Lumbar puncture revealed turbid fluid with normal intracranial pressure (open pressure 15 mmH_2O, close pressure 13 mmH_2O) and high white blood cell count (23,000/cumm), 95% of which were polymorphonuclear cells (PMN). There were 100 red blood cells/cumm. The CSF protein was elevated (558 mg/dl) but CSF sugar was low (22 mg/dl, blood sugar 146 mg/dl). The peripheral white blood cell count was 17,000/cumm, 89% of which were PMNs. The electrolytes were normal. Chest film showed generalized alveolar infiltration of the right lung. The results of blood and CSF cultures were negative for bacteria. Computer tomography of the brain was not performed.

He was treated as bacterial meningitis with intravenous penicillin (200,000 U/kg/d) and chloramphenicol (100 mg/kg/d). The next day, his consciousness deteriorated with development of convulsions. Endotracheal intubation was needed on the third day and the pupils were 5 mm, fixly dilated on the fourth day. He died five days after admission. The autopsy was performed six hours after death, with consent limited to the brain and thoracic organs.

The brain weighed 1,430 *g*. The meningeal coverings were congested. The brain appeared edematous with petechial hemorrhage on the surface. The olfactory bulbs were necrosed (Fig 1). There was suppurative exudate and focal necrosis of the basal parts of the frontal, temporal lobes, pons, cerebellum, medulla and spinal cord. Bilateral tonsillar and uncal herniations were noted. Serial sections of the brain showed normal cerebral cortex and white matter except at the base of the brain, where necrosis was noted. The entire spinal cord was enlarged and soft to friable. Serial coronal sections revealed the subarachnoid space to be occupied by white to grey soft tissue compressing the spinal cord (Fig 2).

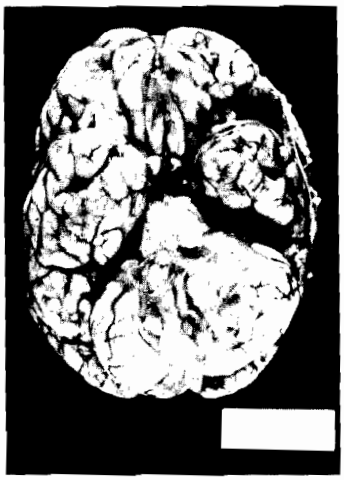

Fig 1–Ventral surface of brain, showing necrosis and suppurative inflammation of olfactory bulbs and base of brain extending from frontal lobe to the brain stem.

Microscopic examination revealed dense PMN infiltration of the meninges and subarachnoid spaces, particularly the basal surface of the brain. Vasculitis was noted. Clusters of *Naegleria* trophozoites were seen within purulent exudates and in the necrotic areas of the cerebral cortex including the cerebellum. They were also present within Virchow-Robin spaces (Fig 3A). The trophozoites were 8-10 microns in diameter with indistinct cytoplasm and round nucleus. The nucleolus was prominent, approximately 3 μ in diameter and often eccentrically located. Peri-nucleolar clearing was observed (Fig 3B). The subarachnoid space of the spinal cord was packed with cerebellar tissues resulting from se-

Fig 2–Cross sections of the spinal cord, showing packed subarachnoid spaces by degenerated cerebellar tissue and inflammatory exudates.

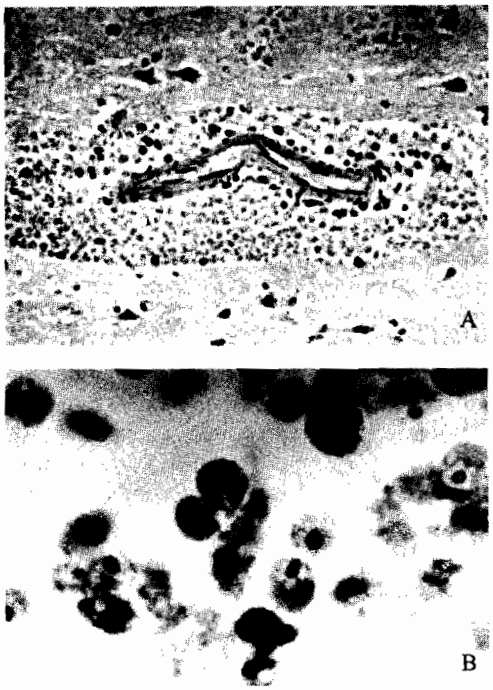

Fig 3–(A) *Naegleria* trophozoites in the Virchow-Robin space of the brain with mild chronic inflammatory cell reaction and vasculitis. Hematoxylin and eosin, × 500.

(B) Histologic detail revealing typical indistinct cytoplasm, eccentric nucleolus and perinucleolar halo. Hematoxylin and eosin, × 1,000.

vere her-niation and necrosis of the cerebellum. Inflammatory cells, particularly PMNs, were present in large numbers in the dura mater, subarachnoid space, nerve roots and spinal cord parenchyma. Clusters of *Naegleria* trophozoites were observed in the area of the pericentral canal of the spinal cord with minimal leukocytic reaction (Fig 4). Neuronal degeneration and demyelinating foci were observed in the infected areas.

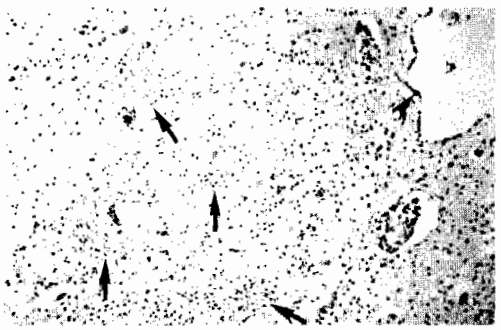

Fig 4–*Naegleria* trophozoites (arrow) present in the area of the pericentral canal of the lumbar level of spinal cord (arrowhead). Note the early inflammatory reaction as characterized by early tissue destruction and inflammatory exudates. Hematoxylin and eosin, × 250.

Both lungs showed severe edema with evidence of diffuse alveolar damage confined to the right lung. The heart was unremarkable.

PAM caused by *Naegleria fowleri* remains a global problem. The organism is thermophilic and can be detected in metalimnion and hypolimnetic iron layers of thermal stratification during mid summer (Klye and Noblet, 1985). The incubation period varies from 2-14 days. Patients usually present with high grade fever, severe headache, nausea and vomiting, meningeal irritation and convulsions. Exact time of exposure could not be determined in this patient since he swam regularly in the canal. The clinical course ran down quickly from the onset of the symptoms to death (7 days). In Thailand, PAM was firstly reported in 1983 (Jariya *et al*, 1983). Since then, there have been a few more cases reported (Somboonyosdech *et al*, 1987; Charoenlarp *et al*, 1988; Sirinavin *et al*, 1989; Poungvarin and Jariya, 1991). The reported cases in Thailand had the following histories: three swimming in fresh water (Jariya *et al*, 1983; Somboonyosdech *et al*, 1987; Sirinavin *et al*, 1989), one with water thrown on the face during water festival (Songran) (Charoenlarp *et al*, 1988), one without swimming (Poungvarin and Jariya, 1991) and no information in the other case (Somboonysdech *et al*, 1987). However, there were several cases from Australia where no history of swimming in fresh water could be elicited (Dorsch *et al*, 1983).

Early detection and treatment of the infection is vital to the patient's survival. The history of swimming in fresh water before the onset of meningitis can be a clue to stimulate metriculous observation of the CSF specimen. In fresh preparation, the trophozoite is motile, showing vacuolated cytoplasm and large nucleolus. It may be better visualized if the condenser of the microscope is lowered to enhance the contrast. If the trophozoites is left in water, a flagellated form occurs (Gutierrez, 1990). In this case, the trophozoites could have been misinterpreted as polymorphonuclear leukocytes. Amphotericin B hence was not given. All six surviving cases were treated with amphotericin B alone (Anderson and Jamieson, 1972) or with additions of sulfadiazine (Apley *et al* 1970), rifampicin, miconazole and sulfisoxazole (Seidel *et al* 1982), rifampicin and ketoconazole (Poungvarin and Jariya, 1991) and rifampicin plus chloramphenicol post surgical drainage (Wang *et al*, 1993).

Duma *et al* (1971) documented two cases where spinal cord involvement were severe. Areas of necrotic and demyelinating foci were found in the cerebral white matter. The present report disclosed severe spinal cord infection as shown by the presence of *Naegleria* trophozoites, neuronal damage and demyelinating foci. The sign and symptoms of spinal cord damage were not clinically detected because the patient was unconscious throughout the course of admission. A thorough neurological evaluation is recommended to recognize a case of spinal cord involvement for a better treatment planning and ultimately the patient's survival.

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